Calculator Practice AP Questions 1st Semester

1. If $f(x)=\dfrac{e^{2x}}{2x}$, then $f'(x)=$

(A) 1

(B) $\dfrac{e^{2x}(1-2x)}{2x^2}$

(C) e^{2x}

(D) $\dfrac{e^{2x}(2x+1)}{x^2}$

(E) $\dfrac{e^{2x}(2x-1)}{2x^2}$

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2. The graph of the function $y=x^3+6x^2+7x-2\cos x$ changes concavity at $x=$

(A) –1.58 (B) –1.63 (C) –1.67 (D) –1.89 (E) –2.33

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3. Let f be a function such that $\lim\limits_{h\to 0}\dfrac{f(2+h)-f(2)}{h}=5$. Which of the following must be true?

I. f is continuous at $x=2$.

II. f is differentiable at $x=2$.

III. The derivative of f is continuous at $x=2$.

(A) I only (B) II only (C) I and II only (D) I and III only (E) II and III only

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4. Let f be the function given by $f(x)=2e^{4x^2}$. For what value of x is the slope of the line tangent to the graph of f at $(x, f(x))$ equal to 3?

(A) 0.168 (B) 0.276 (C) 0.318 (D) 0.342 (E) 0.551

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5. A railroad track and a road cross at right angles. An observer stands on the road 70 meters south of the crossing and watches an eastbound train traveling at 60 meters per second. At how many meters per second is the train moving away from the observer 4 seconds after it passes through the intersection?

(A) 57.60 (B) 57.88 (C) 59.20 (D) 60.00 (E) 67.40

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6. If $y=2x-8$, what is the minimum value of the product xy ?

(A) –16 (B) –8 (C) –4 (D) 0 (E) 2

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7. If the derivative of f is given by $f'(x) = e^x - 3x^2$, at which of the following values of x does f have a relative maximum value?

(A) –0.46 (B) 0.20 (C) 0.91 (D) 0.95 (E) 3.73

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8. Let $f(x) = \sqrt{x}$. If the rate of change of f at $x = c$ is twice its rate of change at $x = 1$, then $c =$

(A) $\frac{1}{4}$ (B) 1 (C) 4 (D) $\frac{1}{\sqrt{2}}$ (E) $\frac{1}{2\sqrt{2}}$

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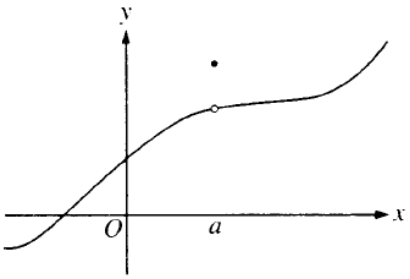
9. 

The graph of a function f is shown above. Which of the following statements about f is false?

(A) f is continuous at $x = a$.

(B) f has a relative maximum at $x = a$.

(C) $x = a$ is in the domain of f.

(D) $\lim_{x \to a^+} f(x)$ is equal to $\lim_{x \to a^-} f(x)$.

(E) $\lim_{x \to a} f(x)$ exists.

10. Let f be the function given by $f(x) = 3e^{2x}$ and let g be the function given by $g(x) = 6x^3$. At what value of x do the graphs of f and g have parallel tangent lines?

(A) –0.701
(B) –0.567
(C) –0.391
(D) –0.302
(E) –0.258

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11. The radius of a circle is decreasing at a constant rate of 0.1 centimeter per second. In terms of the circumference C, what is the rate of change of the area of the circle, in square centimeters per second?

(A) $-(0.2)\pi C$

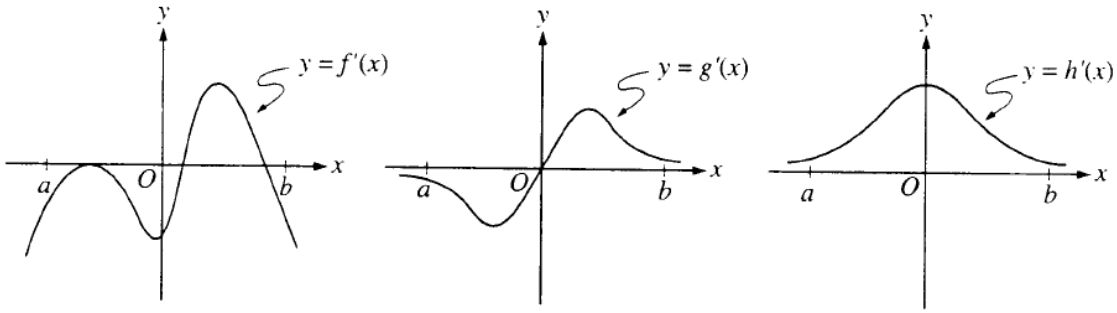
(B) $-(0.1)C$

(C) $-\dfrac{(0.1)C}{2\pi}$

(D) $(0.1)^2 C$

(E) $(0.1)^2 \pi C$

12.



The graphs of the derivatives of the functions f, g, and h are shown above. Which of the functions f, g, or h have a relative maximum on the open interval $a < x < b$?

(A) f only
(B) g only
(C) h only
(D) f and g only
(E) f, g, and h

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13. The first derivative of the function f is given by $f'(x) = \dfrac{\cos^2 x}{x} - \dfrac{1}{5}$. How many critical values does f have on the open interval $(0,10)$?

(A) One
(B) Three
(C) Four
(D) Five
(E) Seven

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14. Let f be the function given by $f(x) = |x|$. Which of the following statements about f are true?

I. f is continuous at $x = 0$.
II. f is differentiable at $x = 0$.
III. f has an absolute minimum at $x = 0$.

(A) I only (B) II only (C) III only (D) I and III only (E) II and III only

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15. If $a \neq 0$, then $\lim_{x \to a} \frac{x^2 - a^2}{x^4 - a^4}$ is

(A) $\frac{1}{a^2}$ (B) $\frac{1}{2a^2}$ (C) $\frac{1}{6a^2}$ (D) 0 (E) nonexistent

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16. Which of the following is an equation of the line tangent to the graph of $f(x) = x^4 + 2x^2$ at the point where $f'(x) = 1$?

(A) $y = 8x - 5$
(B) $y = x + 7$
(C) $y = x + 0.763$
(D) $y = x - 0.122$
(E) $y = x - 2.146$

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17. If g is a differentiable function such that $g(x) < 0$ for all real numbers x and if $f'(x) = (x^2 - 4)g(x)$, which of the following is true?

(A) f has a relative maximum at $x = -2$ and a relative minimum at $x = 2$.
(B) f has a relative minimum at $x = -2$ and a relative maximum at $x = 2$.
(C) f has relative minima at $x = -2$ and at $x = 2$.
(D) f has relative maxima at $x = -2$ and at $x = 2$.
(E) It cannot be determined if f has any relative extrema.

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18. If the base b of a triangle is increasing at a rate of 3 inches per minute while its height h is decreasing at a rate of 3 inches per minute, which of the following must be true about the area A of the triangle?

(A) A is always increasing.
(B) A is always decreasing.
(C) A is decreasing only when $b < h$.
(D) A is decreasing only when $b > h$.
(E) A remains constant.

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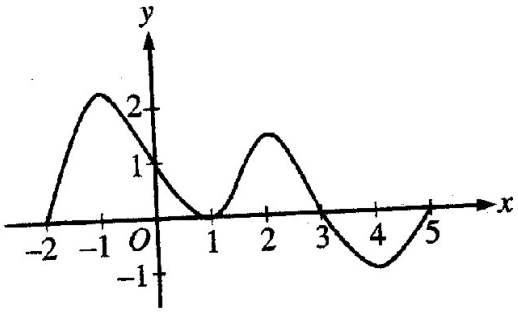
19. Let f be a function that is differentiable on the open interval $(1,10)$. If $f(2) = -5$, $f(5) = 5$, and $f(9) = -5$, which of the following must be true?

I. f has at least 2 zeros.
II. The graph of f has at least one horizontal tangent.
III. For some c, $2 < c < 5$, $f(c) = 3$.

(A) None
(B) I only
(C) I and II only
(D) I and III only
(E) I, II, and III

20.



Graph of f'

The graph of f', the derivative of f, is shown above for $-2 \le x \le 5$. On what intervals is f increasing?

A) [-2,1] only B) [-2,3] C) [3,5] only D) [0, 1.5] and [3,5]

E) [-2, -1] , [1,2], and [4,5]

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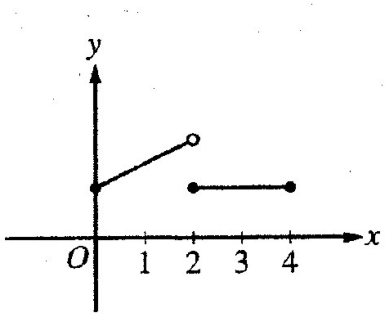

Graph of f

21. The figure above shows the graph of a function f with domain $0 \le x \le 4$. Which of the following statements are true?

I $\lim_{x \to 2^-} f(x)$ exists

II $\lim_{x \to 2^+} f(x)$ exists

III $\lim_{x \to 2} f(x)$ exists

A) I only B) II only C) I and II only D) I and III only

E) I, II, and III

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22. The first derivative of the function f is defined by f ' (x) = $\sin(x^3 - x)$ for $0 \le x \le 2$. On what intervals is f increasing?

A) $1 \le x \le 1.445$ only B) $1 \le x \le 1.691$ C) $1.445 \le x \le 1.875$

D) $0.577 \le x \le 1.445$ and $1.875 \le x \le 2$ E) $0 \le x \le 1$ and $1.691 \le x \le 2$

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23. The derivative of the function f is given by f'(x) = $x^2 \cos(x^2)$. How many points of inflection does the graph of f have on the open interval (-2,2) ?

A) One B) Two C) Three D) Four E) Five

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24. A particle moves along a straight line with velocity given by $v(t) = 7 - (1.01)^{-t^2}$ at time $t \ge 0$. What is the acceleration of the particle at time t = 3?

A) -0.914 B) 0.055 C) 5.486 D) 6.086 E) 18.087

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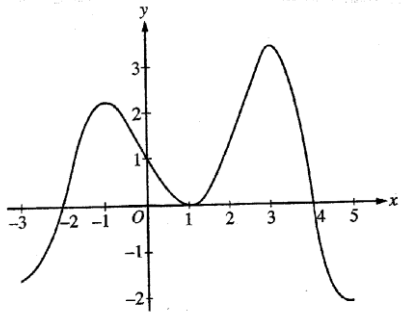

Graph of f'

25. The graph of the derivative of a function f is shown in the figure above. The graph has horizontal tangent lines at x = -1 , x = 1 and x = 3. At which values of x does f have a relative maximum?

A) -2 only B) 1 only C) 4 only D) -1 and 3 only E) -2,1, and 4

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26. The radius of a sphere is decreasing at a rate of 2 centimeters per second. At the instant when the radius of the sphere is 3 centimeters, what is the rate of change, in square centimeters per second of the surface are of the sphere? (The surface are S of a sphere with radius r is $S = 4\pi r^2$)

A) -108π B) -72π C) -48π D) -24π E) -16π

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27. The function f is continuous for $-2 \le x \le 2$ and f(-2) = f(2) = 0. If there is no c, where -2 < c < 2 for which f'(c) = 0, which of the following statements must be true?

A) For -2 < k < 2, f'(k) > 0 B) For -2 < k < 2 , f' (k) < 0

C) For -2 < k < 2, f' (k) exists D) For -2 < k < 2, f ' (k) exists, but f' is not continuous

E) For some k, where -2 < k < 2, f'(k) does not exist

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28. The function f is continuous on the closed interval [2,4] and twice differentiable on the open interval (2,4). If $f'(3) = 2$ and $f''(x) < 0$ on the open interval (2,4), which of the following could be a table of values for f?

(A)

x	$f(x)$
2	2.5
3	5
4	6.5

(B)

x	$f(x)$
2	2.5
3	5
4	7

(C)

x	$f(x)$
2	3
3	5
4	6.5

(D)

x	$f(x)$
2	3
3	5
4	7

(E)

x	$f(x)$
2	3.5
3	5
4	7.5